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“Civil Reserve Air Fleet Stage III: Viability and Implications”

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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**Abstract of**  
**Civil Reserve Air Fleet Stage III: Viability and Implications**

The Civil Reserve Air Fleet (CRAF) is a vital component of the nation's strategic airlift capability. Stage III is the most aggressive CRAF activation level, contributing heavily to wartime lift needs but also withdrawing the greatest amount of capacity from commercial service. This paper explores the thesis that Stage III is not a viable policy option, and examines the impact such a conclusion would have on our two major theater war (MTW) strategy. Section One analyzes the viability of activating Stage III with respect to feasibility ("Could it be done?") and acceptability ("Would it be done?"). To assess the economic and political costs of activation, this section focuses on how much residual air carrier capacity would be left in the private sector after Stage III activation and mobilization of aircrews with reserve component obligations. Section Two examines the affect the absence of Stage III would have on our two MTW strategy. Finally, Section Three puts forth conclusions and makes recommendations to improve the realism of the assumptions that underlie US contingency and airlift modernization plans.

The paper concludes that the economic and political costs of implementing Stage III make the assumption of activation an unsound basis for contingency planning. Also, the absence of Stage III lift capacity would seriously degrade our two MTW strategy, elevating risk in the halting phase of the second MTW and ceding operational initiative to the enemy for a longer period. Recommendations include a call for airline industry executives and senior government officials to reduce Stage III to a level that could be reliably activated in time of crisis. On the basis of this new, smaller Stage III, contingency and airlift modernization plans merit revision.

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## Introduction

### Civil Reserve Air Fleet--The Strategic Lift Context:

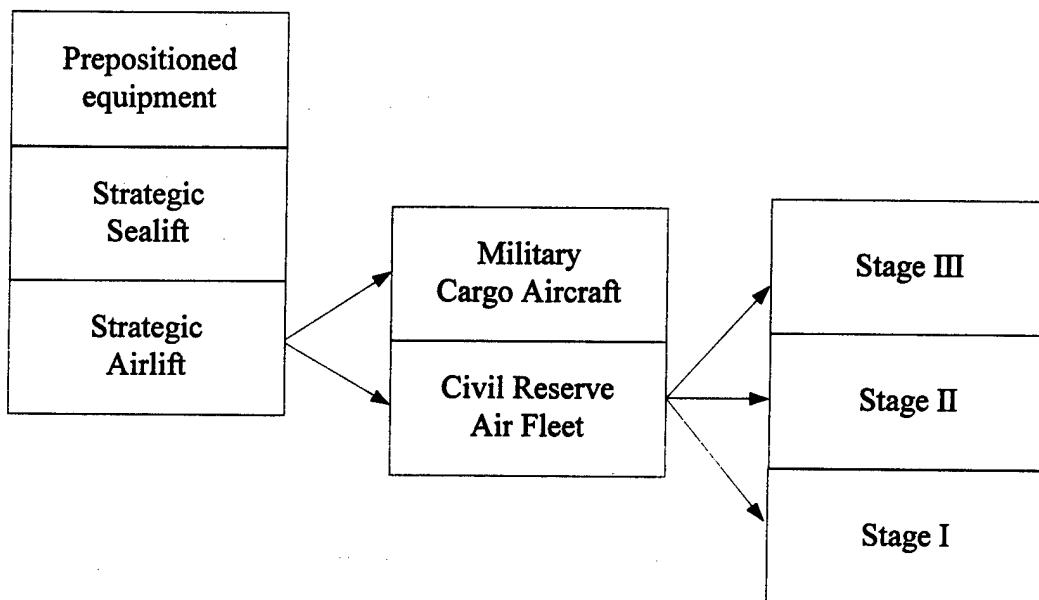
"How and when will the people and equipment I need arrive in theater?" A combination of pre-positioned equipment and strategic air- and sealift provides the answer to this hypothetical commander's question. The strategic airlift subset has long been comprised of both military cargo aircraft and commercial aircraft that private industry voluntarily designates for government duty in time of crisis. The Civil Reserve Air Fleet (CRAF) is the program by which Air Mobility Command (AMC) manages this reservoir of standby capability. Recognizing that conflicts are not all-or-nothing, AMC tailors CRAF implementation to the severity of the situation by activating it in stages. Stage I is the most modest level of activation, Stage II is intermediate, and Stage III represents the maximum level of effort, one which would withdraw over one-half of the nation's long range commercial air fleet for government service. (See graphic next page.)

### Civil Reserve Air Fleet--The Literature:

The existing literature on CRAF covers two broad subject areas. The first deals primarily with devising financial incentives to increase carrier participation.<sup>1</sup> These articles try to close the gap between airlift needs and airlift capability by increasing the number of aircraft committed to the program.

A second area of concern appeared in the literature shortly after Operation DESERT SHIELD/STORM, during which CRAF Stages I and II were activated for the first time ever (Stage III has never been activated). In addition to continuing the discussion of financial incentives, these articles examine the impediments to smooth

## CRAF in the Strategic Lift Context



execution that arose from the integration of commercial assets into a military operation including insurance and indemnity issues, chemical gear protection for civilian crews, command and control, and the military's ability to on-load and off-load such a large fleet of aircraft.<sup>2</sup>

In brief, the literature addresses the question, "How do we get carriers to commit enough aircraft to CRAF?" It also examines the feasibility of program implementation, asking "Could we use all of this airlift effectively and efficiently?" The literature does not examine the acceptability of activating CRAF Stage III from the economic and political standpoint: viability in this regard is assumed. A largely unexamined yet relevant question is, "Would senior decision makers activate Stage III in light of the costs associated with removing so much passenger and cargo capability from the civil sector?"<sup>3</sup> Viability both with respect to feasibility ("Could we activate Stage III?") and acceptability ("Would we activate Stage III?") is of tremendous importance because the capacity resident in Stage III forms the basis for airlift planning as well as war fighting strategies. Neither planning nor fighting, obviously, should be done on the basis of unexamined assumptions.

#### Civil Reserve Air Fleet--The Thesis:

This paper explores the thesis that the Civil Reserve Air Fleet Stage III is not a viable policy option, and examines the impact such a conclusion would have on our ability to respond to a two major theater war (MTW) scenario. Section One analyzes the viability of activating Stage III. Section Two examines the effect the absence of Stage III would have on the win-hold-win two MTW strategy. Finally, Section Three puts forth conclusions and makes recommendations to improve the realism of the assumptions that

underlie US contingency and airlift planning processes.

### Section One: Stage III Viability

**Stage III Viability = Feasibility ("Could we do it?")**

**+ Acceptability ("Would we do it?")**

.....

The purpose of this section is to assess the viability of Stage III, the most aggressive phase of CRAF. Viability will be looked at in two respects. First, **could** Stage III be implemented from a practical perspective? There are two issues of concern here. The air carriers' ability to provide adequate airframes and aircrews is one issue. The second is the military's ability to provide command and control as well as on-load and off-load service (throughput) to keep such a large fleet of planes occupied. A second viability concern is, **would** the Secretary of Defense activate Stage III in light of nontrivial economic and political costs foreseen from such an activation? To assess this concern we look first at the residual capacity airlines would have for commercial service in the absence of the aircrews and airframes committed to CRAF, as well as without aircrew who have reserve component obligations. Then the paper addresses the costs—economic and political—associated with such a reduction in capacity, and who would pay them. On the basis of these costs one can estimate the likelihood decision makers would activate Stage III. Combining "could" and "would" considerations provides an estimate for the viability of Stage III. First, a look at the feasibility of Stage III activation.

**Could Stage III be activated?** One prerequisite for successful activation of CRAF Stage III, of course, is that the air carriers can provide the promised airframes and enough

aircrews. Air Mobility Command's (AMC) Civil Air Division tracks airframe commitments monthly.<sup>4</sup> Also, the governing CRAF regulation specifies air carriers will maintain four crews (each crew consisting of two pilots and, for older aircraft, one flight engineer) per committed airframe.<sup>5</sup> Moreover, these crews must be U.S. citizens and may not be in the reserves.<sup>6</sup> Although CRAF is never exercised per se, on the basis of AMC's careful monitoring it is safe to say the availability of airplanes and crews will not constrain activation of Stage III.

A second portion of the "Could it be done?" question is the AMC's ability to choreograph the movement and provide throughput for this size of fleet (508 aircraft in the long-range section of Stage III) in addition to managing its own airlifters. Looking to the only data point in CRAF activation (Operations DESERT SHIELD/STORM), one finds divergent evidence. On the one hand, significant command and control problems surfaced as Military Airlift Command (or MAC, now known as AMC) managed first Stage I and then Stage II aircraft. Incompatible radios, loads not ready on time, and limited off-load equipment at the arrival airfields all hampered efficient use of civil aircraft.<sup>7</sup> On the other hand, MAC learned from early mistakes, improved team work with the airlines as the contingency matured, and catalogued lessons learned for future operations.<sup>8</sup> From the perspective of some large carriers, however, AMC still lacks the ability to load and unload wide-bodied aircraft quickly enough to make full use of the capability resident in Stage III.<sup>9</sup> This is not necessarily a critique of AMC capability; some ports of debarkation simply lack ramp space to accommodate large numbers of wide-bodied jets.

To summarize the “Could Stage III be activated?” perspective, one can assert that air carriers can provide all aircraft and aircrews committed to Stage III. There is no consensus, however, on AMC’s ability to use these assets fully with respect to throughput. We turn next to the acceptability of activation.

Would Stage III be activated? Estimating residual commercial capacity. Foundational to the economic and political costs associated with CRAF activation is the concept of residual commercial capacity, i.e., once Stage III-committed airframes and aircrews are withdrawn for government service, what percentage of original capacity remains for the private sector?

There are several ways to measure the residual capacity left for commercial operations after the activation of Stage III. Historically, analysts have simply calculated the capacity of airframes remaining. On this basis, the Logistics Management Institute estimated in 1996 that Stage III activation would absorb 46 percent of the nation’s long-range passenger carrying capacity and 58 percent of its long-range cargo capacity.<sup>10</sup> Obviously, this is a serious reduction. This method ignores, however, another dynamic in the residual capacity equation; the MTWs that dictate activation of CRAF Stage III would also require mobilization of reserve component forces.<sup>11</sup> Therefore, the air carriers would have to sustain commercial business without CRAF crews and planes—the results of which are noted above—as well as without aircrew members with reserve commitments. The absence of reserve fliers could further reduce residual capacity, although as we shall see the degree of reduction has not been well documented.

In 1991, the National Defense Transportation Association’s Military Airlift Committee asked its members to assess the combined impact of reserve mobilization and

CRAF activation on normal flight operations. One-quarter of carriers surveyed responded they would be able to conduct less than 75 percent of their normal business after Stage III activation and reserve mobilization.<sup>12</sup> While this survey provides a first cut at the reserve-CRAF interaction, the survey results are of limited use for two reasons. First, the survey is dated; CRAF participation changes on a monthly basis as does reservist representation in commercial airlines. Second, the nature of the survey masks the difference in size amongst air carriers. A large carrier such as American Airlines or Federal Express that could do only 75 percent of its normal business would have a much greater impact on the nation's transportation system than a small carrier with only 50 percent residual capacity, but the survey design does not permit such distinctions. Therefore, one cannot aggregate to calculate nationwide capacity reduction, a vital component in our viability estimate.

This study attempted to improve upon the existing literature by surveying each CRAF carrier to determine the airframes and aircrews remaining in commercial service after both CRAF activation and reserve mobilization. The intent was to combine carrier statistics to gain a picture of the industry's residual capacity as a whole. (See Appendices for sample survey, responses, and methodology.) The survey yielded several insights. First, the percentage of aircrews with reserve commitments varies widely among airlines. For some companies, reservists comprise 15 percent or more of the total crew force, while others employ no reservists. Second, a definitive conclusion on how serious loss of reservists would be on an industry-wide basis is impossible because some airlines do not track how many of their crew members serve in the reserves, while others would not release this information. In particular, some of the largest carriers don't track reservist

information. On the basis of data received, it would appear most carriers keep a high enough crews-to-aircraft ratio that they would have ample crews even after losing reservists. Still, without anyone centrally tracking the reservists it is not evident if there is a problem or not. For the remainder of this paper, I will assume for purposes of discussion that the aircraft-only capacity calculations of the Logistics Management Institute provide a reasonably accurate measure of residual commercial capacity.

Would Stage III be activated? Assessing the costs. In light of the capacity reductions highlighted—nearly one-half of long-range passenger capacity and approximately two-thirds of long-range cargo capacity—what would it cost to activate Stage III and who would bear these costs? Costs would accrue in three arenas: economic costs to the air carriers involved, economic costs to the nation as a whole, and political costs to the decision makers responsible for activation, i.e., the Secretary of Defense and the President. First, the airlines themselves.

Analysts have identified several characteristics that determine how costly CRAF activation would be to an airline, both during and after the actual period of activation. In general, an airline suffers worse economic consequences if it makes high profits from commercial operations, has little or no excess capacity, has a high cost structure, maintains an extensive infrastructure, is dependent on long-term relationships with customers, and makes a heavy commitment to CRAF.<sup>13</sup> For the most part, this describes major lines such as Federal Express or United Airlines as opposed to smaller, charter-oriented operators. AMC attempted to address the first factor, foregone profits from commercial operations, by raising compensation rates based on lessons learned during DESERT STORM. Nonetheless, Stage III activation would remain costly to many

carriers, and especially the majors. Exactly how costly would be a function of circumstance, to include duration of activation. Besides the fact that CRAF-committed airframes generally earn lower revenues than in commercial operations, some carriers fear post-activation costs due to lost market share. This is especially applicable to airlines in market segments with competition that is foreign or less heavily committed to the CRAF.<sup>14</sup>

Another perspective on cost is that incurred by the U.S. economy as a whole. There is no consensus on a dollar figure attributable to Stage III activation, although one can look to several indicators of the severity of the costs.<sup>15</sup> As noted earlier, the mere fact of taking close to one-half of long range passenger capacity and almost two-thirds of long range cargo capacity out of the economy would be serious. The increasing reliance of business on just-in-time delivery practices accentuates their vulnerability to an interruption in air service. A proxy for cost comes from the 1997 UPS strike. Although not a perfect match for CRAF activation (the UPS strike halted truck delivery service as well as air movement of cargo) the shut down of this one air carrier alone had an impact. Economists estimated the strike would have reduced the national economic growth rate by 20 percent, had it continued into September.<sup>16</sup> The situation was serious enough that Federal Reserve Chairman Alan Greenspan asked UPS to provide an estimate of the overall costs to the economy.<sup>17</sup> In the event, mail-order retailers saw their business drop 10-15 percent even though all other carriers and the US Postal Service attempted to take up the slack.<sup>18</sup> Extrapolating to two-thirds of air cargo service out of commercial use, one gains an appreciation for the magnitude of the economic difficulties of Stage III activation.

The final component of Stage III activation costs would be political. The Secretary of Defense activates Stage III, a decision he would surely make only after consultation with the President. Given the economic costs to the airlines specifically and the economy generally, would these decision makers pay the political cost which would forcibly accompany activation? Any answer is inherently speculative, but several indicators suggest Stage III activation is not politically acceptable. First, during Operation DESERT SHIELD/STORM some carriers resisted even Stage II activation prior to the (normally profitable) holiday travel rush.<sup>19</sup> Anecdotal evidence also indicates that as the Air Force considered Stage III activation to cope with the cargo backlog accumulating at Dover AFB, some carriers looked into their ability to mobilize political pressure to prevent such a decision.<sup>20</sup> Second, the Clinton Administration's reaction to the American Airlines and UPS strikes in 1997 reveals an acute sensitivity to interruption of air carrier service. In the former case, the President used his emergency powers under the National Railway Labor Act to order pilots back to work for a 60 day cooling-off period. President Clinton acted four minutes into the strike.<sup>21</sup> In the UPS case, Secretary of Labor Alexis Herman personally intervened to help assure a timely settlement.<sup>22</sup> The combination of carrier reaction to the specter of Stage III activation and political responses to the shutdown of even one major carrier strongly suggests Stage III activation is not a viable option from the political as well as the economic perspective.

Several counter-arguments can be made to suggest Stage III would, in fact, be an acceptable policy response to an extreme national crisis. While these perspectives do not spring from one source or individual, and therefore do not follow a consistent logic, they are nonetheless worthy of consideration. The first such viewpoint is that Stage III would

not be needed for very long—weeks, not months—and therefore the economy could withstand the interruption in air service for such a brief period. Second, some carriers anticipate that any crisis so severe it required Stage III would also depress the national economy to the point that foregone business in the commercial sector would be of reduced significance.<sup>23</sup> Third, on a patriotic note some industry spokesmen simply assert their companies would support the national need in spite of cost, again due to the severity of any national crisis meriting Stage III lift.<sup>24</sup>

Viability in the balance. Overall, does Stage III meet a standard of viability that makes it a valid basis for contingency planning? From the feasibility, or “Could Stage III be done?” perspective, the only concern would be the military’s ability to exploit fully the capacity of committed aircraft, particularly in terms of throughout. Limited throughput would not prevent activation, but it might reduce the hoped-for delivery capacity of Stage III. The other concerns arise from the “Would Stage III be activated?” perspective. Specifically, Stage III represents such a large percentage of the nation’s air fleet that activation would harm the airline industry and the economy at the very time senior political leaders would be attempting to marshal support to fight two wars. Indeed, political will is at the heart of the viability controversy. Given the U.S. track record over the last 35 years—public opinion did not support economic sacrifice on behalf of either the Vietnam or Persian Gulf Wars—political will to fight two MTWs is by no means a foregone conclusion. Specifically, assuming public opinion would rally in support of an economic downturn on behalf of two DESERT STORM-type conflicts at once is not a sound basis for a policy assumption. A more prudent foundation for contingency planning would be to assume Stage II is the maximum contribution of the CRAF. What

would be the consequences of responding to a two MTW scenario with only Stage II at AMC's disposal?

## Section Two: Operational Impact

The purpose of this section is to assess the impact of CRAF Stage III not being available to support airlift needs in a win-hold-win, two MTW scenario. We begin with the airlift requirements of a two MTW scenario, calculate the shortfall created by the absence of Stage III, and then analyze the operational implications of the gap between requirements and capability.

The Joint Staff's 1995 Mobility Requirements Study Bottom-Up Review Update (MRS BURU) detailed the requirements for two near-simultaneous MTWs with many of the broad results unclassified. The study outlined an overall airlift requirement of 49.4 - 51.8 million ton-miles per day (MTM/D) to maintain moderate risk, about one-third of which comes from CRAF.<sup>25</sup> The most demanding situation, and the one that drives the need for Stage III activation, is the halting phase of the second MTW, in which initial troops and equipment are airlifted to the second theater while build-up phase troops and cargo are still flowing to the first theater. To meet these demands, MRS BURU specifies a passenger-moving requirement of 130 wide-body equivalents (WBEs) from CRAF.<sup>26</sup> Cargo requirements reflect a combination of lift capacity, or pure tonnage, and outsized cargo movement. Only wide-bodied aircraft can move the latter types of cargo. MRS BURU recommended maintaining a minimum of the baseline CRAF cargo fleet, which in 1995 included 61 narrow-body as well as 73 WBEs in Stage III.<sup>27</sup>

The absence of Stage III aircraft creates a gap between requirements and capacity in both the passenger and cargo categories. For passengers, CRAF Stage II currently provides 88 WBEs, short of the 130 WBE requirement by one-third.<sup>28</sup> For cargo, Stage II provides 13 MTM/D or 76 WBEs of long range capacity. This is below requirements by about 25 narrow bodies and 10 WBEs.<sup>29</sup> In summary, even using all AMC military aircraft and Stage II CRAF, the lack of Stage III leaves AMC well short of the total airlift need, although the shortfall is greater for passenger movement than cargo.

How does one put the requirement-capability gap in operational terms? We know from MRS BURU that the gap occurs in the halting phase of the second MTW.<sup>30</sup> The delivery priorities in this phase include Army troops who would fall in on pre-positioned equipment, plus airmen and equipment that accompany Air Force fighter wings. The passenger shortfall alone would therefore delay combat-ready times for all types of units. The cargo shortage would hamper combat readiness as well, but since passenger delivery shortfall is greater in degree it would likely be the limiting factor.

Specifically, an illustrative halting force of three heavy brigades and five land-based fighter wings would take one-third longer to deploy, such that when the CINC planned to have his entire halting force in place he would have only two brigades and three fighter wings. Consequently, these units would be slower to gain air superiority, as well as to muster significant ground power and CAS and interdiction capability. This delay represents a serious reduction in fighting power, especially when one recalls that MRS BURU examined a baseline lift fleet on the basis of maintaining moderate risk to war fighting objectives.<sup>31</sup> The overall objective of the halting phase is to stop an enemy attack rapidly. The phase requires timely delivery of troops and equipment to

defend against short notice attack, minimize loss of territory, and avoid loss of critical facilities. Risk in the halting phase is defined as the likelihood of failing to bring the enemy to a halt without loss of critical forces, locations, or infrastructure. Moderate risk, attained by the Stage III-dependent baseline fleet, means one must accomplish all essential objectives and some combination of key objectives. In this light, cutting the initial combat power of the halting force by one-third could easily lead to the loss of additional territory, locations, and infrastructure. Detailed war gaming to evaluate risk levels is beyond the scope and classification of this paper, but one could readily foresee boosted risk.

Other concerns would afflict the lift-starved theater CINCs. First, the enemy would retain the operational initiative longer in the second MTW. Similarly, resolution of both MTWs would take longer, eating quickly into the limited supply of public support available in the US. In a related vein, casualties would likely be higher in the outnumbered halting force, which would also erode public support.

Overall, if CRAF Stage III were not available to support a two MTW scenario the CINC in the second theater would face increased risk in the form of slower buildup of his halting force with accompanying higher casualties and decreased public support. In view of the grim consequences of reduced lift, it is time to turn to suggestions for improvement.

### Section Three: Conclusions and Recommendations

The purpose of this section is to review and synthesize the conclusions made so far and to make corresponding recommendations to improve the lift planning process.

Conclusions:

1. Conventional analysis of Stage III implementation ignores the dynamic of reservist aircrew mobilization when calculating residual commercial capacity. On the basis of survey responses this study estimates the resultant inaccuracy is not large, but a definitive answer is not possible because some carriers could not, and others would not, provide reservist information. Moreover, without any central tracking mechanism it will be impossible to identify if a problem arises in the future.
2. The costs of activating CRAF Stage III which will accrue to the carriers, the national economy, and senior political leaders are sufficiently high to make the assumption of activation an unsound basis for contingency planning. While this study has not definitively proven Stage III would never be used, substantial doubt exists. The basis for planning assumptions, obviously, should be that which is most plausible; assuming political leaders will pay the price associated with Stage III activation is not plausible.
3. The unavailability of Stage III lift capacity would elevate risk in the halting phase of a second MTW, cede the initiative to the enemy for a longer period, raise casualties, and extend the time required to fight both MTWs.

Recommendations:

1. For air carriers with a CRAF commitment, AMC should periodically track reservists as a percentage of total crew force.
2. Senior representatives from the Departments of Defense, Transportation, and Commerce as well as AMC should meet with air carrier executives to determine a maximum viable CRAF commitment greater than Stage II but less than the current

Stage III. A chief criterion for sizing would be a level of effort that could be reliably activated in time of a military crisis without bringing a concomitant economic crisis on the industry or the country. It is particularly important to avoid rationalizing the current Stage III by insisting "We can always activate only part of Stage III" because this leaves planners with no firm baseline.

3. Revise mobility planning. Current mobility planning should be revised to reflect a maximum of the newly downsized Stage III as defined above. This change in assumptions would have implications for two aspects of mobility planning. The first is contingency plans, and specifically airlift of troops and equipment for the halting phase of the second MTW of a two MTW scenario. The short answer to the analysis may be, "It can't be done without the current Stage III," but it is better to have addressed the shortfall in a realistic fashion during peace than to face unpleasant reality for the first time in war.

The second aspect of mobility planning to be re-looked is airlift modernization. Current acquisition timetables for the C-17, for example, assume all three stages of CRAF are available upon need in time of crisis. A more realistic appraisal would be to assume a viable, revised Stage III was the maximum to be attained from the private sector, and make other plans for the remaining MTM/D requirement.

#### Summary

The Civil Reserve Air Fleet provides AMC with a low-cost reservoir of airlift surge capacity from which to draw in time of crisis. Looking to the worst-case scenario of supporting two near-simultaneous MTWs, AMC has understandably asked air carriers for what it needs: a massive Stage III commitment of aircraft. The carriers have responded admirably, allocating over 500 aircraft. Both AMC and the Joint Staff do

mobility planning on the basis of these aircraft being available during war. Unfortunately, none of these actors has the institutional incentive to ask hard questions about the viability of implementing such a program. This study addresses the viability question, asserts that CRAF Stage III is neither politically nor economically viable, and suggests that work remains to be done in determining a realistic basis for airlift planning.

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<sup>1</sup> See, for example, Mary Chenowith, The Civil Reserve Air Fleet: An Example of the Use of Commercial Assets to Expand Military Capabilities During Contingencies (Santa Monica CA: RAND Corporation, 1990).

<sup>2</sup> See, for example, Carl Behrens, "The Civil Reserve Air Fleet: The Past, First Use, and the Future," (Unpublished Research Paper, Air War College, Air University, Maxwell AFB AL: 1994); and, Donn P. Kegel, "Improving the Civil Reserve Fleet," (Unpublished Research Paper, U.S. Army War College, Carlisle PA: 1993).

<sup>3</sup> See, however, Roger K. Coffey and Ronald F. Frola, The Civil Reserve Air Fleet: Trends and Selected Issues (McLean VA: Logistics Management Institute, 1996). Coffey and Frola raise the issue of the cost to the economy and note the absence of empirical data in this regard.

<sup>4</sup> "Civil Reserve Air Fleet (CRAF) Capability Summary [HQ AMC Form 312]," Civil Air Division, Headquarters Air Mobility Command, 1 January 1998.

<sup>5</sup> Chenowith, 7.

<sup>6</sup> Ibid.

<sup>7</sup> J.R. Gebman and others, Finding the Right Mix of Military and Civil Airlift: Issues and Implications Vol 2 (Santa Monica CA: RAND Corporation, 1994), 50-51; Ronald Priddy, A History of the Civil Reserve Air Fleet in Operations DESERT SHIELD, DESERT STORM, and DESERT SORTIE (Cambridge MA: Arthur D. Little, Inc., 1993), 89-90, 94, 242-243.

<sup>8</sup> Priddy, 90-91, 94, 242-243.

<sup>9</sup> Gary Molinari, Managing Director of Charter Programs, Federal Express, telephone conversation with author on or about (o/a) 23 April 1998.

<sup>10</sup> Coffey, 3-18.

<sup>11</sup> Joint Chiefs of Staff, Mobility Requirements Study Bottom-Up Review Update (Washington, D.C.: March 28, 1995), p. C-2 Table C-1; also, author's estimates.

<sup>12</sup> CRAF Activation Study Group, Questionnaire Analysis, (National Defense Transportation Association: 1991), E-3C.

<sup>13</sup> Coffey, 3-18.

<sup>14</sup> Gebman, 54.

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<sup>15</sup> Coffey, 3-18.

<sup>16</sup> Peter Anin and others, "Labor's Deliverance?" Newsweek, 25 August 1997, 28.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

<sup>19</sup> Gebman, 54.

<sup>20</sup> Ibid.

<sup>21</sup> Matt Bai and Karen Breslau, "Turbulence Still Ahead," Newsweek, 24 February 1997, 48.

<sup>22</sup> Leslie Kaufman and Rich Thomas, "Woman of the Hour," Newsweek, 25 August 1997, 30.

<sup>23</sup> Molinari telephone conversation.

<sup>24</sup> Mr. William Quackenbush, Manager of Military/Government Sales, American Airlines, telephone conversation with author 30 April 1998.

<sup>25</sup> Joint Chiefs, Mobility Requirements, ES-6 and III-A-6.

<sup>26</sup> J.J. Langer and J. Browne, eds., Mobility Requirements Study Bottom-Up Review Update (MRS BURU) (The United States Naval War College National Security Decision Making Department), 48.

<sup>27</sup> Ibid, 49.

<sup>28</sup> "Civil Reserve Air Fleet (CRAF) Capability Summary [HQ AMC Form 312]," Civil Air Division, Headquarters Air Mobility Command, 1 January 1998.

<sup>29</sup> Ibid.

<sup>30</sup> Langer, 48.

<sup>31</sup> Joint Chiefs, Mobility Requirements, ES-2, III-A-6, VI-1.

## Appendix A: Carriers Surveyed

CRAF carriers surveyed (international segment, long range section):

- Delta Airlines
- Sun Country Airlines
- American Trans Air
- Tower Air
- Arrow Air
- Air Trans International/Burlington
- Atlas Air
- Federal Express Airlines
- Polar Air Cargo
- Airborne Express
- American International Airways
- Trans Continental Airlines
- United Airlines
- American Airlines
- Continental Airlines
- North American Airlines
- Northwest Airlines
- World Airways
- Fine Airlines
- Emery Worldwide Airlines
- Evergreen International Airlines
- Southern Air Transport
- United Parcel Service

Survey responses received:

- Sun Country Airlines
- American Trans Air
- Arrow Air
- Atlas Air
- Airborne Express
- American Airlines
- World Airways
- Evergreen International Airlines
- United Parcel Service

## Appendix B: Example Survey

Naval War College  
686 Cushing Road  
Newport, RI 02840

22 Apr 98

Mr. Shawn Erving  
Sun Country Airlines  
Sr. Mgr. Operational Plng  
2520 Pilot Knob Road  
Suite 250  
Mendota Heights, MN 55120

Dear Mr. Erving:

I am writing to ask your assistance in gathering information for a Naval War College research project on the Civil Reserve Air Fleet (CRAF). My general area of concern is air carriers' ability to conduct viable commercial operations during activation of CRAF Stage III. Not only would such activation absorb many airframes, but also pilots (at the agreed 4:1 ratio) at a time when airline pilots with National Guard and Reserve commitments are unlikely to be unavailable for commercial flying.

Specifically, I would appreciate your providing the following information:

1. Your current fleet size by airframe type (I already have CRAF committed airframes from AMC)
2. Your total number of pilots and flight engineers
3. How many of your pilots and flight engineers have National Guard or Reserve commitments

Your response on the attached form either by e mail or fax would be ideal

I appreciate your time and effort. If you have any questions or need clarification my home phone number is (401) 847-5955.

Sincerely,

MARK W. GRAPER, Lt Col, USAF

To: Lt Col Mark W. Graper  
FAX: (401) 841-2460 or 841-2191  
E Mail: 105415.2323@compuserve.com

From: Mr. Shawn Erving  
Sun Country Airlines  
Sr. Mgr. Operational Plng  
2520 Pilot Knob Road  
Suite 250  
Mendota Heights, MN 55120

1. Current fleet size by airframe type:

<u>Type</u>	<u>Number</u>
-------------	---------------

2. Total number of pilots and flight engineers:

3. Total number of pilots and flight engineers with National Guard or Reserve commitments:

4. Other comments or concerns regarding the CRAF program:

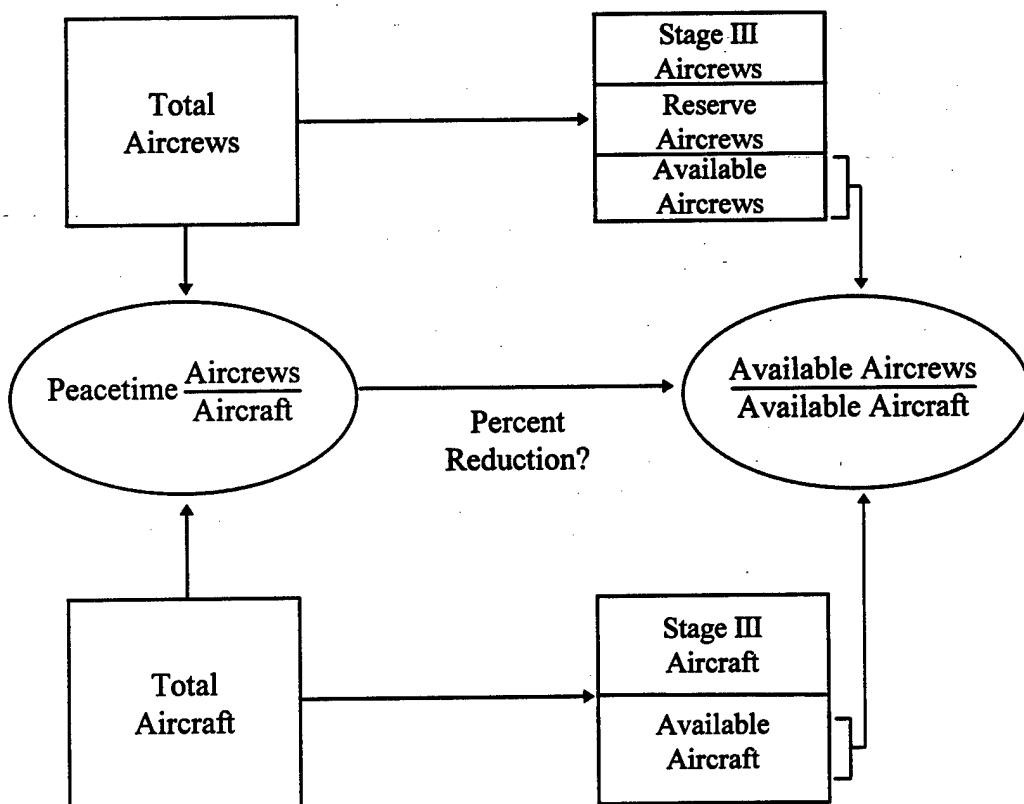
(Thank you again for your time!)

## Appendix C: Survey Methodology and Interpretation

The original thought in this study is not the concept of "residual capacity," because airline industry analysts have long known the demands of Stage III would leave many carriers with few aircraft to conduct commercial operations. Rather, the examination of this concept in tandem with mobilization of reservists--removing still more aircrews from commercial flying--is the innovation.

A proxy for commercial capacity per aircraft is the aircrew-to-aircraft ratio. Assuming a given carrier is well postured to use its fleet of aircraft efficiently in peacetime, any lowering of the aircrew-to-aircraft ratio would reduce capacity. For example, if an airline usually kept eight crews in service for each aircraft but CRAF and reserve commitments lowered that to four crew per aircraft, we surmise that, all else being equal, the productivity *per aircraft* would be lowered in proportion to the change in ratio, i.e., halved. To calculate residual capacity one would therefore start with the reduction in aircraft available and then factor in the change in crew ratios.

The diagram below illustrates the simple arithmetic flow applied to each carrier's survey response.



A few words on definitions and terminology. An "aircrew" or "crew" is the set of people necessary to fly the aircraft (exclusive of flight attendants). Newer aircraft require two pilots, typically described as one captain and one first officer. Older aircraft need two pilots plus a flight engineer.

Some respondents broke out their aircrew data in detail, specifying numbers of captains, first officers, and flight engineers by type of aircraft assigned. Others responded in lesser degrees of detail, not dividing out flight engineers from pilots or not specifying how many crew members were qualified on which types of aircraft. In the latter cases I assumed crews were divided proportionally to the number of aircraft in the carrier's fleet—an assumption favorable to airline productivity.

The survey results are incomplete in the sense one cannot calculate an industry-wide incremental reduction in commercial capacity attributable to reservist mobilization. This is so for several reasons. First, the low percentage of respondents necessarily means the responses do not capture the entire industry. Besides those carriers who simply did not respond, some replied they would not provide the requested information as a matter of policy, i.e., their legal departments advised against putting reservist crew data in the public domain. Second, several carriers could not provide reservist information because they do not track it. Finally, most of the few carriers who show a reduction in residual capacity due to reservist mobilization also commit a large percentage of their fleets to CRAF. These generally smaller airlines often do a large part of their peacetime business for the government, as well. Reduced productivity of their few aircraft is less significant to the nation than would be the case for a large carrier on whom many people and businesses would still rely for service after CRAF activation and reserve mobilization.

A final note. For reasons listed above, one cannot conclude there is a problem with reduced residual capacity attributable to reservist mobilization. On the other hand, one can conclude no one in the industry or the military will know if a problem does develop because no one is monitoring the reservist data in key airlines.

Appendix D: Survey Results

Notes

1. Abbreviations: P = pilot, FE = flight engineer
2. Aircraft-to-aircrew ratios listed are the lower (i.e. the most constraining) of pilots or flight engineers as appropriate
3. "Reduced residual capacity" is expressed as a percentage reduction in aircrew-to-aircraft ratio.

Carrier	American Trans Air	Atlas Air	American	Airborne Express	Arrow Air
<b>Total Aircraft</b>	14 L-1011 24 B-727 7 B-757	18 B-747	640 (approx)	72 DC-9 36 DC-8 3 B-767	3 L-1011 9 DC-8
<b>Stage III Aircraft</b>	13 L-1011 24 B-727 7 B-757	10 B-747	93	-----	2 L-1011 5 DC-8
<b>Available Aircraft</b>	1 L-1011	8 B-747	547	-----	1 L-1011 4 DC-8
<b>Total Aircrew</b>	527 Ps 190 FEs	301 Ps 121 FEs	9000 (approx)	Unknown	L-1011 20 Ps, 12 FEs DC-8 39 Ps, 25 FEs
<b>Stage III Aircrew</b>	352 Ps 121 FEs	80 Ps 40 FEs	-----	-----	L-1011 16 Ps, 8 FEs DC-8 40 Ps, 20 FEs
<b>Reserve Aircrew</b>	19 Ps 27 FEs	18 Ps 7 FEs	Unknown	150	None
<b>Available Aircrew</b>	156 Ps 42 FEs	203 Ps 74 FEs	-----	-----	L-1011 4 Ps, 4 FEs DC-8 "1" Ps, 5 FEs
<b>Aircrew-to-Aircraft Ratio—Peacetime</b>	5.1:1 L-1011 9.3:1 B-757 5.0:1 B-727	6.7:1	-----	-----	3.3:1 L-1011 2.2:1 DC-8
<b>Aircrew-to-Aircraft Ratio—Available</b>	15:1 L-1011 NA B-757 NA B-727	9.25:1	-----	-----	2:1 L-1011 does not compute DC-8
<b>Decrease in Aircrew-to- Aircraft ratio?</b>	No	No	-----	-----	yes L-1011 yes DC-8
<b>Reduced residual capacity?</b>	No	No	-----	-----	36% L-1011 does not compute DC-8
<b>Comments</b>			Does not track reservists	Cannot calculate—no total aircrew data. Airborne is leaving CRAF	

Carrier	Evergreen Air	North American	Sun Country Airlines	UPS	World Airways
<b>Total Aircraft</b>	12 B-747 8 DC-9	3 B-757	11 B-727 6 DC-10	14 B-747	8 MD-11 4 DC-10
<b>Stage III Aircraft</b>	12 B-747 3 DC-9	2 B-757	7 B-727 2 DC-10	6 B-747	8 MD-11 1 DC-10
<b>Available Aircraft</b>	5 DC-9	1	4 B-727 4 DC-10	8 B-747	3 DC-10
<b>Total Aircrew</b>	178	30 Ps	B-727 93 Ps, 53 FEs DC-10 31 Ps, 18 FEs	99 Captains 101 FEs 83 1 <sup>st</sup> Officers	256 Ps 27 FEs
<b>Stage III Aircrew</b>	180	16 Ps	B-727 56 Ps, 28 FEs DC-10 16 Ps, 8 FEs	23 Captains 24 FEs 24 1 <sup>st</sup> Officers	MD-11 64 Ps DC-10 8 Ps, 4 FEs
<b>Reserve Aircrew</b>	6	1 P	8 Ps	3 Captains 32 FEs 13 1 <sup>st</sup> Officers	10 Ps 6 FEs
<b>Available Aircrew</b>	"-8"	13 Ps	B-727 29 Ps, 25 FEs DC-10 15 Ps, 10 FEs	72 Captains 45 FEs 46 1 <sup>st</sup> Officers	166 Ps 17 FEs
<b>Aircrew-to-Aircraft Ratio—Peacetime</b>	3:1	5:1	4.2:1 B-727 2.6:1 DC-10	5.9:1	10.6:1 MD-11 6.8:1 DC-10
<b>Aircrew-to-Aircraft Ratio—Available</b>	"0"	6.5:1	3.6:1 B-727 1.9:1 DC-10	5.6:1	NA MD-11 5.6:1 DC-10
<b>Decrease in Aircrew-to-Aircraft ratio?</b>	Yes	no	yes	yes	yes
<b>Reduced residual capacity?</b>	Yes	no	14% B-727 27% DC-10	6%	18%
<b>Comments</b>	evidently no aircrew available for commercial ops			Data only for 747 fleet	

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